BULETINUL Universităţii Petrol – Gaze din Ploieşti	Vol. LXII No. 4B/2010	161 - 166	Seria Tehnică

The Application of Acquisition and Monitoring Based on the Accelemetre ADXL202EB and NI DAQ USB-6008 -Plate

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Abstract

In this paper it will be presented the monitoring and aquisition application based on the ADXL202EB ACCELOMETRE AND THE PLATE NI DAQ USB-6008 (the hardware and the software needed for the aqusition, monitoring and processing the data)

Key words: *sensor – the accelometre ADXL202EB, plate of acquisition NI DAQ USB-6008, THE PLATFORM LabVIEW 8 from the NATIONAL INSTRUMENTS.*

Introduction

In this work it will be presented the monitoring and acquisition application based on the ADXL202EB ACCELOMETRE AND THE PLATE NI DAQ USB-6008 (the hardware and the software needed for the acqusition, monitoring and processing the data)

The acquisition application has three major components, which will be each presented

1) The used *sensor – the accelometre ADXL202EB*;

2) The used *plate of Acquisition - NI DAQ USB-6008*;

3) the software realised for the aquisition, using *the platform LabVIEW 8 from the NATIONAL INSTRUMENTS.*

The Sensor - adxl202eb Accelemetre

The ADXL202EB from the Analog Device has the base the dual accelemetre ax ± 2g ADXL202 to whom it can be added the three passive components, depending on the type of application.

The ADXL202EB has five pines which include both the signal and charging lines.

The scheme and the description of the ADXL202EB are presented in figure 1 and also in the chart 1 where there are specified the values of the determinations of the other possible passive components to be added.

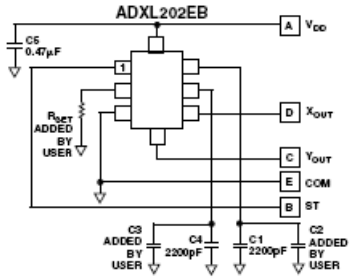


Fig. 1

T2 Period (ms)	R_{SET}
1	124 kΩ
2	248 kΩ
5	620 kΩ
10	1.24 MΩ

Chart 1

The value of the R_{se} resistor establishes the T_2 a PWM period the way it is shown in the 1 chart. In figure 2 there is presented the placement and the description of the components on the ADXL202EB plate, and the chart 2 shows the meaning of the pines.

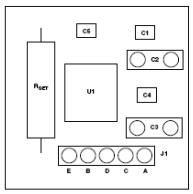
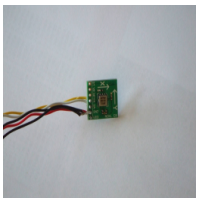


Fig. 2

Pin Reference	Pinout
E	Ground
B	Self-Test Input
D	X Axis Duty Cycle Out
C	Y Axis Duty Cycle Out
A	+V Supply (3 V to 5 V DC)

Chart 2

Yellow - Y_A signal(vibrations) on OY
Red –;+; V_{cc}
Black –GND
White – X_A signal(vibrations) on OX



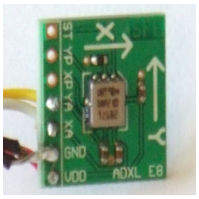


Fig. 3.
Connexions and signals

The sensor gives to every exit a signal in tension in scale 2,10 – 2,60 mV, interval suitable for the endings of the scale -2g, +2g

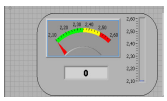


Fig. 4

In this way, to 2,10 mV are suitable -2G, and to 2,60 mV are The interval from 0,10 mV is divided on the scale into four , for each division being suitable the 025 mV. For a 0,1 mV division are suitable: 0,8G = 0,8*9,8m/s^2=7,84 m/s^2. 1G has the correspondent 0.125 mv

NI DAQ USB-6008 Plate

For developing we choose the platforms from the National Intrument DAQ, 60xx. series. The advantages of these plates are the fallowing:

1) They are both compact and unitary as a category;

2) They are perfectly compatible, no matter which is the solution of communication with the PC;

3) They have the drivers included for the operation system, solving the problem of the accessibility to the resourse operation systems;

4) Offers the plate/ development environment LabVIEW 8 soft.

So, this plate contains:

1. The communication with any kind of calculation system no matter if it is a desktop or a laptop.

2. The communication is realised with the help of USB interface which has a very goood speed of sending.

3. The distance between the system of calculation and the plate (and the process) may be maximum 25 metres.

NI DAQ USB-6008 Plate

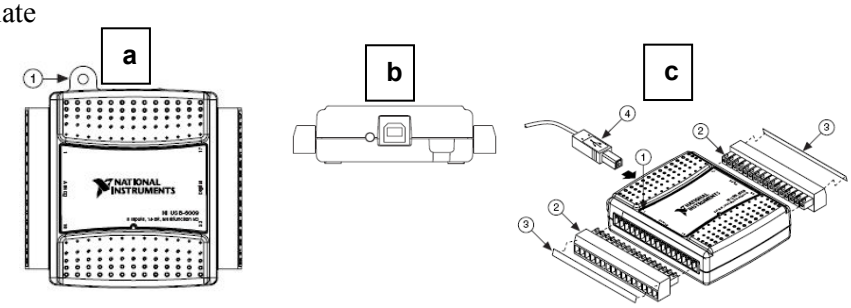


Fig. 5.

In figure 5 **a** – up view, 5 **b** – frontal view, at USB entrance, 5 **c** – on the whole view:

1 – up face; 2 sand 3 band for the I/O signals on the side entrance, 4 USB connection wire.

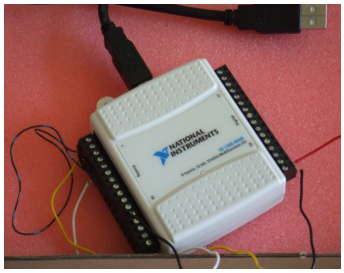


Fig. 6. Plate picture

The NI DAQ USB-6008 has: 8 analogical entrances; 2 analogical exits; 12 digital I/O; 1 counter of 32 bits

Now, i am going to present the functional diagrame of NI DAQ USB-6008 plate.

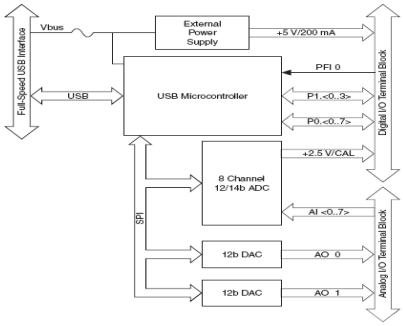


Fig. 7. functional diagram

The description of the meaning of all contacts is made in 4 and 5 chart

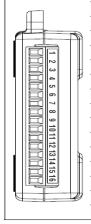
Module	Terminal	Signal, Single-Ended Mode	Signal, Differential Mode
	1	GND	GND
	2	AI 0	AI 0+
	3	AI 4	AI 0–
	4	GND	GND
	5	AI 1	AI 1+
	6	AI 5	AI 1–
	7	GND	GND
	8	AI 2	AI 2+
	9	AI 6	AI 2–
	10	GND	GND
	11	AI 3	AI 3+
	12	AI 7	AI 3–
	13	GND	GND
	14	AO 0	AO 0
	15	AO 1	AO 1
	16	GND	GND

Chart 3 analogical I/O

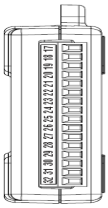
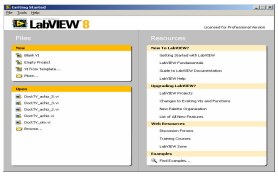
Module	Terminal	Signal
	17	P0.0
	18	P0.1
	19	P0.2
	20	P0.3
	21	P0.4
	22	P0.5
	23	P0.6
	24	P0.7
	25	P1.0
	26	P1.1
	27	P1.2
	28	P1.3
	29	PFI 0
	30	+2.5 V
	31	+5 V
	32	GND

Chart 4 digital I/O

Software Realized for the Acquisition

The application for the acquisition was realized using the development plate LabVIEW 8 from NATIONAL INSTRUMENTS.



The LABVIEW 8 plate offers all the needed opportunities in order to achieve and to monitor an acquisition application from a process as we are going to show you now:

1. the package offers predefinite „capsules" (which are already implemented) for all the customary needed operations: - conversions; changes of recording the data; scalars; and moduls;

2. the predefinite moduls for the graphical/visual interface: the buttons; the bar graphs; analogical bar graphs; charts;

3. the changes of hoarding the aquisitioned data: files systems of different types which offer the compatibility with different other handling , interpreting, producing and analyses applications; there is the possibility of saving the data in different sizes in order to be imported in different applications;

4. Different ways of simulation.

Next, we are going to present the graphical interface of the application and also the system of saving/hoarding the data

The user interface

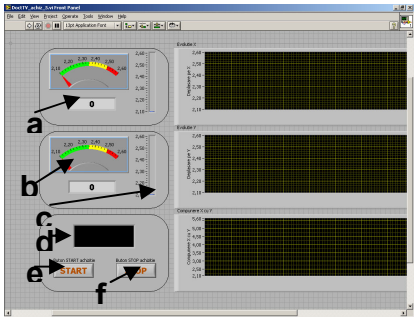


Fig. 8. The user interface

a –the bar of numerical display of the momentary measured value.
b -Analogical bar of the display graph of the momentary measured value.
c - Graphicals bar of displaying the momentary measured value.
d - Display window of the time/clock of acquisition.
e – the buttom of starting the data acquisition.
f – the buttom of stopping the data acquisition.

So, if the scale's endings are definite, as we mentioned to 2, 10 mV corresponds-2G, and to 2, 60 mV corresponds 2G.

And the entire interval contains 20 divisions, this establishes for one division a 0,2G variation

In figure 9 is presented the process of acquisition **on,** realising the acquisition on the OY axis .

We have to underline the fact that the application acquisitions displays and stoks/saves the data about the system's acceleration on **OX** an **OY**axis.

The programme realizes both the display and hoarding the acceleration's results (the resultant of the acceleration is obtained from the composition of the acceleration on the OX axis with the acceleration on the OY axis).

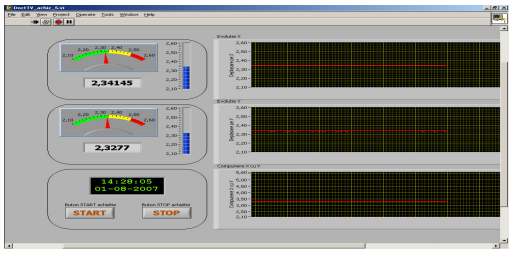


Fig. 9. Acquisition on the OY axis

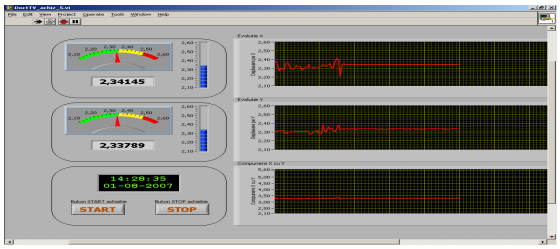


Fig. 10. Acquisition on the OX axis

In figure 10 is presented the process of acquisition on, realising the aquision on OX axis

In figure 11 is presented the process of acquisition ON, realising the aquisition on both OX and OY axis, and also the display of the acceleration's resultant

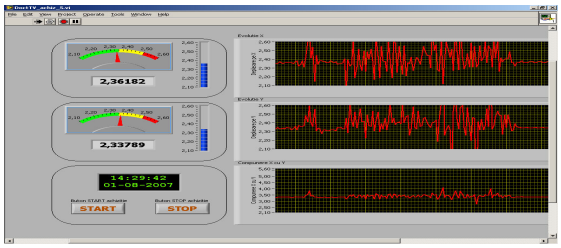


Fig. 11. The display of the acceleration's resultant

The system of data's hoarding/saving

Once you start the button of starting the acquisition, the system creates a folder of hoarding the data. It appears a new window where there are made the options of saving: 1. The introduction of folder's name and data; 2. The location where it will be stiked; 3. The type of folder's kind (the extension) in which the data are going to be stoked.

In figure 12 it is introduced an example of saving the data in a folder of text kind(txt), this kind having the advantage of being keyed, imported (compatible) in different further applications as: chart's calculation (excel for graph and charts), data base, html, etc.

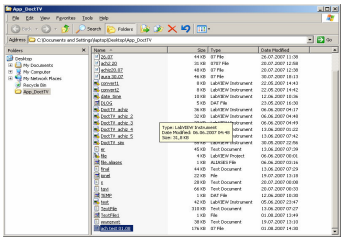


Fig. 12,

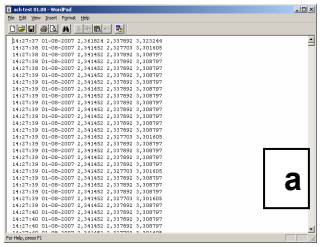


Fig. 13a

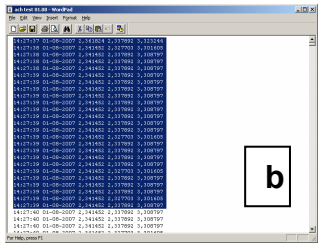


Fig. 13b

In figure 13 a and b are introduced the data's folder content , the organisation of the data and also their quantity in one second interval

In figure 13 a, the data's organisation is made in the fallowing way: - column 1: **hour:minute:second** of the aquisition; - column2: **day-month-year of the acquisition; -** column 3: the acceleration on **OX**.axis; - column 4: the acceleration on **Oy**axis. In figure 13 b is presented the number of acquisitions realised in a second on the two axis and also their resultant. The system takes with a range of **20 data per second on every axis.**

Conclusion

In conclusion, we can state:

The plate from NI (made from the plate NI DAQ 6008 and the LABVIEW medium) can assure portability and compatibility needed for the further development. For the entire and complete determination of the parameters of a vibrating system can be added to this plate a movement sensor , and a sensor of angular speed. The realised application is taken as it is and is completed with a graphical bars suitable for the other sensors

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Aplicatie de achizitie si monitorizare bazata pe accelerometrul ADXL202EB si placa NI daq usb-6008

Rezumat

În aceasta lucrare este prezentat un sistem de achizitie si monitorizare bazat pe accelerometrul ***ADXL202EB*** *si placa* ***NI DAQ USB-6008*** *("hardware"-ul si "software"-ul necesar achizitionarii, monitorizarii si prelucrarii datelor).*